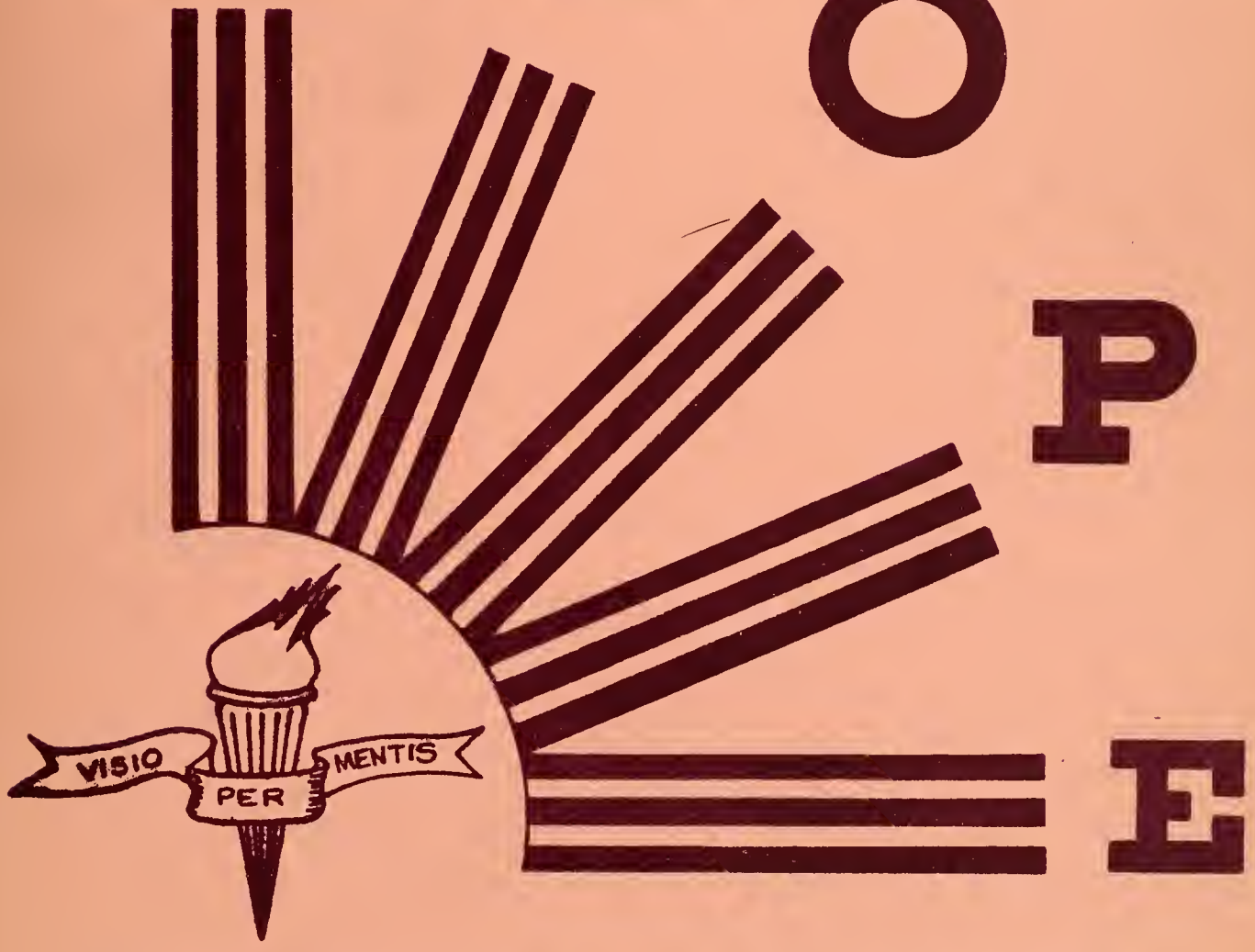
THE SCOPE

JANUARY - FEBRUARY, 1956



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THE SCOPE

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ELECTRON MICROSCOPE

By PETE PARESKY

On Friday afternoon, January 6, the entire sophomore class was invited to attend a demonstration of the Electron Microscope at Massachusetts Institute of Technology. The group was led by Dr. Leslie B. Wright, instructor in Physical Optics and Illumination.

Upon assembling in the Food Technology and Biology Laboratory Building, we were introduced to our host, Dr. Sizer. Dr. Sizer gave us a brief talk on the many merits and practical applications of the electron microscope before conducting us on a tour of his laboratory. One of his assistants along with Dr. Sizer explained numerous parts of the microscope to us.

We had learned, in our Physical Optics course at school, that the Electron Microscope is a powerful optical instrument with possible magnifying power in the high thousands. Throughout the M.I.T. laboratory were many exhibits of printed pictures made from the microscope. The powerful magnifying effect of the microscope could readily be seen as one closely observed the pictures.

Many of our group viewed specimens in the process of being photographed and were allowed to manipulate the dials on the microscope. One particular microscope had a rather interesting specimen in it that we observed in the viewer. We were told that this specimen was a quantity of collodial polystyrene and it appeared to us to resemble a lumpy mass. Upon closer inspection and with the aid of a fine focus adjustment knob, we were able to distinguish various depths of the molecular structure of the substance.

Exhibited specimens that were photographed included tobacco plant, cilia from a Paramecium (a one-celled microscopic animal), and other interesting items.

We wish to express our thanks to Dr. Wright, along with Dr. Frank Kozol, who made possible for us the opportunity to see the Electron Microscope. Our special note of thanks to Dr. Sizer for his enlightening demonstration.

* * * *

FORT BENNING, Ga. — Capt. Bernard K. Levin of (18 Hubbard Avenue) Cambridge, Mass., preventive medicine officer and chief of A-9 Outpatient Clinic at the U. S. Army Hospital at Fort Benning, is attending a course in atomic medicine at Walter Reed Army Medical Center, Washington, D. C.

The professional short course, entitled "Medical Atomic Casualties," was held Jan. 30-Feb. 8.

Capt. Levin attended City College of New York, Boston College of Physicians and Surgeons and *Massachusetts College of Optometry*. He entered the Army in February, 1951.

He served as chief of the Preventive Medicine Division, headquarters of the Ryukyus Command, before coming to Fort Benning last October.

Capt. and Mrs. Levine, the former Christina Collins of Cambridge, have a son Krellan, 7.

SPACE PERCEPTION

Some Physiological and Psychological Aspects

By ROBERT E. BANNON*
SOUTHBRIDGE, MASS.

(I.) INTRDOUCTION: There have been some confusing references in our literature relative to space perception, depth perception, stereopsis, visual manipulation of space, spatial distortions, normal and anomalous spatial localization, etc. The "space perception" that is referred to when speaking of aniseikonia is something different from the same, or similar, expression used with respect to strabismus. Likewise, the "space perception" of a myope or a hyperope presumably refers to something distinctive according to one group but, to another, the term "space perception" seems related to personality patterns. It has also been pointed out that what we have known as heterophoria is but "a disorganization in space perception."

In the field of industrial or occupational vision, and also with respect to motor vehicle operators' vision,, there has been reference to an individual having "no depth perception" because he failed to pass a test for stereopsis. The implication seems to be that such an individual would be a hazard to himself and others because he cannot judge correctly the relative position of objects in space.

When one begins to look for information on the subject of "space perception," he may be impressed first—(and that is where he may stop)—with the idea that the judgement of objects in space is solely a psychological matter. On the other hand, one's choice of reading or of the lectures he attends may be such that the physiological aspects of visual perception are stressed exclusively. There are also a few who may be attracted by the recent emphasis on the mathematical analysis of space perception and conclude prematurely that physiological and psychological factors can be disregarded. That each of these disciplines (psychology, physiology, mathematics) offer significant and essential facets to the understanding of the role of vision in space perception should be realized by the serious student, and the experienced practitioner.

This paper is an attempt to present briefly some of the salient physiological and psychological aspects of the visual perception of space.

Nativism and Empricism: One of the most interesting subjects in the field of physiological optics is the phenomenon of visual perception. The question of how a physical stimulus which affects an end organ (receptor) can give rise to a conscious state and result in an awareness of a material object—its color, form, size and distance—has been a subject for discussion for centuries. The ancient philosophers (Aristotle, Aquinas, Suarez) solved the problem to their own satisfaction by reasoning on the data of immediate observation and introspection. However, with the revival in the natural science through the past two centuries, the "experimental method" has become the constant working basis. With the introduction of this technique since the time of Wundt (1859-1911) considerable progress has been made in understanding the nature and the laws of visual perception.

For many years, there have been two opposing schools of thought relative to the fundamental basis of space perception. On the one hand there are nativists who maintain that the perception of space is an *innate* attribute of the act of vision; That as soon as a person sees objects, he is aware of their relative positions in space. The other school of thought, the empiricists, claim that when a person sees first, all objects, near and far, appear on a flat surface close to the eyes; that subsequently the person *learns* to utilize certain factors and acquires the ability to perceive relative spatial positions correctly.

There have been many experiments, much rational evidence, and considerable discussion

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in favor of and against both sides. On certain matters, there is a wide gap between the two great schools of visual perception. However, Boring has pointed out that every nativist is something of an empiricist, and every empiricist something of a nativist. It is impossible to determine which theory is right since each invokes different realms of thought. They are both right from their specific points of view. They constitute different views of the same fact, and it is the finiteness of the human mind which limits our verification of reality. Fortunately, it is not necessary to settle the question in order to discuss many aspects of the visual perception of space and to show how certain circumstances, internal and/or external, influence our conception of the relation of objects in space to each other and to ourselves.

(II.) PHYSIOLOGICAL CONSIDERATIONS:

The following section outlines the visual reaction system with the emphasis on its physiological foundations and its stimulus-response relationships. The stimuli (light) reaching the peripheral visual organ, the retina, having passed through the physical changes imposed on them by the refractive media, produce physical and chemical changes in the retinal receptors. These changes in turn cause alterations and excitations which are transmitted to the central nervous system and appear in our consciousness as impressions of form, color, and other geometric relations.

This represents what may be called the *sensory part* of the visual process. These events give rise to a whole chain of responses in the motor system of the eyes—in the central and peripheral nevous arrangements and in the internal and external muscles of the eyes. The eyes thus form a sensory-motor unit which may be said to be in the service of the sensory system. The motor apparatus of the eyes has no independent significance. It serves to bring a sharp image of the object under consideration on the fovea and to keep it there by positioning the two eyes relative to each other in such a way that the lines of gaze intersect at the point of fixation thereby insuring and maintaining binocular vision.

These motor reactions are of various types. Briefly, they constitute, aside from the voluntary movements, unconditioned and conditioned reflex motor responses. For example, if the illumination varies, the pupil contracts or dilates. When the head is tilted toward one shoulder, the eyes make a parallel torsional movement in such a direction that the vertical meridians of the retinas tend to remain vertical. These two highly useful motor responses are unconditioned reflexes which can neither be impeded nod produced voluntarily. When a light stimulus reaches the periphery of the retina, the eye turns so that the stimulus impinges on the region of the best visual acuity, the foveal region. If the fixated object approaches, the two eyes converge in order to maintain binocular fixation. When the fixation is changed, the two eyes are somewhat dissociated and they make adjusting movements, called fusional movements, in order to attain and maintain binocular fixation. All these movements are for the most part reflex in nature, but nevertheless there is a significant difference between these movements and the reflex movements previously mentioned.

If one is engaged in thought or in concentration upon a certain object, he may not notice an object approaching from the side and may fail to turn his eyes toward it. Convergence, or overconvergence, can be controlled voluntarily and under certain conditions, fusional movements may not be possible. All these eye movements, in contradistinction to the true reflex movements, require the cooperation of the cerebral cortex, particularly the act of attention. Hofmann and Bielschowsky (1900) in their study of the fusional movements of the eyes noted the quasi-reflex nature of the fusional movements. They were also aware that these movements are dependent upon the concurrence of attention. They termed, therefore, the fusional movements as psycho-optical reflexes. At that time, Pavlov's work had just begun. Today, the reflex movements which require the cooperation of the cerebal cortex are designated as "conditioned reflexes."

Recapitulating, then, one may say that all eye movements, other than voluntary, are unconditioned or conditioned reflexes which are performed in the service of the sensory aspects of vision; specifically, in the interest of clear, distinct, binocular vision.

Whenever a retinal element is simulated by light entering the eye, the stimulus is not only perceived as being of a certain *intensity* (light

sense); of a certain *color* (color sense); and of a certain *form* (minimum separable, discrimination of points, form sense), but it is also localized in a certain *direction*. Every stimulation of a discrete retinal area produces a complicated sensation which is localized as to its direction in space. If a retinal area located to the left of the fovea is stimulated, the stimulus is perceived in the right side of the field of vision; and, vice versa, if the stimulated retinal area is located to the right of the macula, the stimulus is localized in the left half of the visual field.

The result of this arrangement is that if an object is imaged on a peripheral retinal area and one's attenion is attracted to it, the eye will be turned toward the object. The amount of the movement is gauged by the eccentricity of the stimulated retinal area. The more eccentric the area stimulated, the greater the eye movement. Therefore, it is believed that the retinal elements have a retino-motor value which increases from the fovea to the periphery of the retina. The purpose of this reflex is to bring the object of attention quickly and accurately upon the area of highest visual acuity. There is still greater significance; it is that one must attribute to each retinal element a definite *directional,* or *spatial value*. These directional values are intrinsic qualities of the retinal elements.

However, the directional or spatial values of the retinal elements are not fixed absolutely in space. They are fixed only *relative* to the visual direction produced by the stimulation of the fovea and they change in space with the change in position of the visual direction of the fovea. Therefore, they are more properly called *relative visual directions*.

The fact that certain retinal elements of the two eyes, for example, the two foveas, have a common visual direction is the basic principle in the physiology of binocular vision. It is known as the *law of the common visual directions*.

Retinal elements which have common visual directions are called *corresponding retinal points;* all others are *non-corresponding* or *disparate* retinal elements. This is one of the most

★ Please turn to page 12

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† T.M. REG. BY AMERICAN OPTICAL CO.

BASKETBALL

By SUMNER KAGAN

M. C. O. — 77; CARNEGIE — 49

This game proved to be an easy win for M. C. O. as Carnegie was outscored in each period by fairly large margins.

High-scorers were Brouillette—21, Bibeault —14, and Kagan—12.

MASS. COLLEGE OF OPTOMETRY

	G	F	P
Hughes, rf	3	3	7
Bibeault, lf	7	0	14
Amaral	3	1	7
Brouillette, c	8	5	21
Kagan, rg	6	0	12
Manning	3	0	6
A. Rascati, lg	4	0	8
E. Rascati	0	0	0
Totals	34	9	77

CARNEGIE INSTITUTE

	G	F	P
Ivebener, rf	3	0	6
Fredericks	1	0	2
Glazdowski, lf	6	4	16
Deveto, c	3	1	7
Gagnon, rg	1	0	2
Kenney	0	0	0
Droukis, lg	7	2	16
Totals	21	7	49

M. C. O. — 79; BURDETTE COLLEGE — 72

Always a strong contender, Burdette had been considered a threat to the M. C. O. chances of taking over first place in the league. However, from the first tap-off the optometrists apparently aware of this threat played inspired ball. They quickly began to pile up points and completely bottled up Burdette, which could get nowhere against the M. C. O. defense.

The first period ended with the Maroon and White maintaining a comfortable margin, the score being 28-16. During the second and third periods Burdette was unable to cut down their deficiency and continued to trail by 12 points going into the final period. M. C. O., resting on the security of its substantial lead, allowed the opposition in their uphill fight to close the margin slightly in the fourth period, but the Kuhn-men were at no time in danger of losing the lead.

The team gained strength due to the addition of Charlie Casey, who showed great promise playing double pivot with Bob Brouillette. Casey demonstarted some fine ball-handling and was in part responsible for the high percentage of rebounding by M. C. O. in this game. Needed height was also added by Gene Amaral.

MASS. COLLEGE OF OPTOMETRY

	G	F	P
Bibeault, rf	7	1	15
Casey, lf	4	3	11
Amaral	0	0	0
Brouilette, c	14	14	42
Kagan, rg	1	2	4
Lombardo	1	0	2
A. Rascati, lg	1	3	5
E. Rascati	0	0	0
Totals	28	24	79

BURDETTE COLLEGE

	G	F	P
Wilcox, rf	1	0	2
Sheppard	0	0	0
McAllister, lf	4	0	8
MacCarthy	0	0	0
Kristo, c	11	8	30
Belcher	3	1	7
Schiaro, rg	5	2	12
McDermott	1	0	2
Shaw, lg	4	3	11
Stella	0	0	0
Totals	29	14	72

M. C. O. — 89; NEWTON J. C. — 73

In this game, played at the Newton High School gym, the optometrists took an early lead with the first period score (26-14) again

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OMEGA EPSILON PHI

By BOB GRAHAM and PAUL LaBELLE

During the past few months most of our time was spent in preparation for the "raising" of the pledgees to the rank of brothers . . . This "raising" involved a period of hazing, h - - -ll nite, and finally the actual initiation.

During the period of hazing the *prospective* brothers were instructed to wear certain attire and to carry some "Novel" articles on their person. We are glad to say that these instructions were carried out quite well by the majority of the pledgees (there are always a few who think that they can make demerits vanish like magic)

H - - - ll nite was held one week before initiation. On this night the pledgees were given *"Certain Chores"* to perform. Some of the easier ones included the purchasing of a chicken by two pledges, both of whom were high on the demerit list and whose identities are now known to all . . . The pledgees then walked their newly acquired "pets" up Tremont Street to the Hotel Toraine, later they *donated* them to the President for his porcellain play-yard.

Another "chore" involved the ordering of coffee and donut "to go" from Ma Levin's. All the other "chores" ran along similar lines. . . . A party at one of the most prominent Brother's house followed. From reports the Brothers enjoyed themselves more than the pledgees at this "social" gathering (In fact the *more* prominent the *more* they enjoyed themselves as anyone there will testify) . . . . A great deal of credit is to be given to the pledge committee which included "Red" Fiorentino, "Stud" Manning, Paul Stein, Pete Piscia, and Paul LaBelle.

Initiation was held last Thursday nite within the "hallowed halls" of the school. The paddles which the pledgees made for their Big Brothers were used to good advantages that nite . . . . Pledge Captain "Bru" (not to be confused with Brew) did an outstanding job, as did his privates; Good, Inclima, Shapiro, Fiorentino, and Milot.

"Drops of Aqueous"

$64,000.00 Question — Where are the Drapes?

Congrats to Brother Boruillette for his fifty (50) point effort (I guess conditioning pays off).

The Brothers from O. E. Phi. made a good showing at the Eyeball (in more than one way). Incidently if I remember right O. E. Phi. made a pretty good showing at a party before the Eyeball at Brothers LaBelle and Manning's.

We are proud to welcome into the Fraternity as Brothers the following:

Nathan Akeley
Louis Bardfield
Robert Bibeault
Thomas Callahan
Dewey Clason
Robert Couch
Maurice Edwards
Alan Foye
Francis Gencarella
Philip Hughes
Vincent Iannuzzi
Richard Kavner
Joseph Lombardo
Albert Tyroler

Some girls are like paint: Get them stirred up and you can't get them off your hands.

* * * *

Smart young thing to personnel manager: "If you must know, my last boss fired me because of a mistake I wouldn't make!"

* * * *

High-pressure auto salesman to customer: "You realize, of course, that while you're standing there dickering your car is depreciating!"

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PROMULGATION OF ODD STORIES

By DUKE DRUCKER

Approaching the entrance to the lair of POS I was beset by the loud wails of two ragged looking cotton-pickers, waving a banner with the words "The South Will Rise Again." Brothers Howie Klapper and Macy Sezzin just found out the legislatures of West Virginia and Maryland ordered a rise in the price of Kik-A-Poo Joy Juice from 4c to 5c a barrel. Oh shad shad daysh.

Upon entering the lair a startling phenomenon immediately caught my eye. The far wall was visible for the first time in twenty years. Some intrepid brothers had done a magnificent job of clearing out all the treasured junk accummulated and donated through the years.

Before going any further I must pause to give full vent to this item. On March 3rd, 1956, commencing at 7:30 P.M., at the Hecht House in Dorchester, for the insignificant donation of $1.00 per couple, will take place the most stupendous, colossal, fabulous even of the year. It will be the annual Alumni Basket-Ball Game. Sponsored of course by those grand fellows of POS, with an able assist from Dr. Kuhn. With all due respect to OEPhi, POS is terrific!

It is rumored that through the noble efforts of Howie Coleman with assists from Marshall Cohen, Bruce Trevens, and Forest Seavey, plus an undisclosed sum of money; POS will in the near future acquire a new set of furniture. Something in early American. (Does anyone know how to set up a wigwam?)

The stellar event of the year for POS our annual Banquet, is scheduled for the night of April 18th. It is on that great occasion all new brothers will receive their fraternity pins, and formal induction, (into POS that is).

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BASKETBALL [Contined]

setting the pace for the rest of the game. M. C. O. needing only to defend its easily gained margin was not outscored in any period.

The fast pace continued during most of the game with both teams frequently employing a fast break and with shooting percentages quite high.

The outstanding feature of the contest was the phenominal scoring of Bod Brouillette especially from the foul line. Bob capitalized on the many personal fouls committed against him by hitting on 22 out of 29 free throws and managing to score a total of 50 points.

MASS, COLLEGE OF OPTOMETRY

	G	F	P
Hughes, rf	7	7	21
Bibeault, lf	2	0	4
Brouillette, c	14	22	50
Kagan, rg	5	0	10
E. Rascati	0	0	0
A. Rascati, lg	1	0	2
Lombardo	1	0	2
Manning	0	0	0
Totals	30	29	89

NEWTON JR. COLLEGE

	G	F	P
McCarthy, rf	1	4	6
Hassard	4	1	9
Rice, lf	3	1	7
Biescher	4	0	8
Clark	0	0	0
Dunn, c	1	0	2
Classey	2	4	8
McMullin, rg	15	1	31
Manser	0	0	0
Newcomb, lg	1	0	2
Totals	31	11	73

M. C. O. — 83; CHAMBERLAIN — 51

This game was a breather in the M. C. O. schedule. However in spite of the superiority of the Maroon and White, the game was played in a rather slip shod fashion. The Kuhn-men easily outscored their opponents during each period but Chamberlain frequently either stole the ball from the unconcerned optometrists or intercepted one of the latter's haphazard passes. This was especially the case during the first half of the game.

Irregardless of these continual annoyances, the M. C. O. five managed to contain their tempers marvelously and continued to play the same brand of sloppy ball. The game did not prove to be very exciting and was a good illustration of that old sports maxim stating that it takes a good opponent to bring out the best in a team or individual.

An interesting sidelight of this game occured in the middle of the fourth period when Bob Brouillette decided to give the other members of his team a rest and played the remainder of the game singlehanded. He would take the ball off the defensive boards and dribble through the entire Chamberlain team scoring on lay-ups while his teammates stood watching, completely unneeded, and even tempted to take their showers while Brouillette finished the game alone.

MASS, COLLEGE OF OPTOMETRY

	G	F	P
Hughes, rf	9	7	25
Bibeault, lf	3	0	6
Amaral	2	0	4
Brouillette, c	9	13	31
Kagan, rg	3	3	9
Lombardo	3	0	6
A. Rascati, lg	1	0	2
E. Rascati	0	0	0
Totals	30	23	83

CHAMBERLAIN COLLEGE

	G	F	P
Martin, rf	2	0	4
Duggan	0	0	0
K. Mudgett, lf	2	0	4
Mutry	1	0	2
Norman, c	7	3	17
Morin, rg	2	3	7
Prew	0	0	0
Wheeler	0	0	0
Semerero, lg	7	3	17
D. Mudgett	0	0	0
Totals	21	9	51

A Bostonian was showing an Englishman the sights of his native city and finally took him out to the Bunker Hill Monument.

"This is where Warren fell, you know," he explained.

The Englishman looked pensively up at the tall shaft.

"Nasty drop! Killed him, of course?"

THE DAY OF RECKONING

By HOWARD M. COLEMAN

The Time: 12: Noon
The Place: Luxurious classrooms situated in the Main Building of the Massachusetts College of Optometry Campus.
The Circumstance: Final Examination — Geometric Optics
12:00 Noon

Examinations passed out. Several students pass out. One agonized scream of "McLaurin's Theory ! !" Gum chewing starts.
12:45 P.M.

Many sighs and much flexing of muscles and wrists. Gum chewers speed up the pace.
1:00 P.M.

A few students beginning to assume a resigned expression — others with no expression. No sign of jaw fatigue among the gum chewers.
1:45 P.M.

Few students sitting back with eyes closed. Asleep? Thinking? Unconscious?
1:30:P.M.

Korb takes off his shirt. Afentakis begins to mutter imprecations in Greek.
1:35 P.M.

Korb puts on his shirt, starts yanking at tufts of his hair. Huffman takes off his Panama Hat.
1:40 P.M.

Donato finishes. Given a noisy send-off consisting of gasps and sighs.
1:45 P.M.

Some machine assumes a noisy status outside the building. Air compressor? Sand-Blasting? Helluva Racket ! !
1:50 P.M.

Dr. X, the proctor, announces in a gleeful tone "Ten minutes left." Announcement greeted by universal hair-yanking, feverish mopping of brows, sudden speed up in gum chewers' pace, and a rapid flipping of pages of the Log Tables.
1:55 P.M.

Ames breaks the seal on his third package of Canada Mints. Garand breaks his pencil. Most faces appear grim.
2:00 P.M.

The end at last. Papers are collected. Majority of students seem numb. One led away carefully, giggling hysterically. Good percentage of students head for local coffee shop, "The Stable", where the post-mortem discussions will be held over a schooner of coffee.

POS [Contined]

Brother Marvin, Big Mamoo of the Gowanus has already begun a systematic starvation diet in preparation for the forthcoming feast.

In closing this sordid scramble I must pass along this gem overheard in a cafe.

A young man approached the head waiter and asked for a table. The head waiter asked him if he had a reservation. The young man looked at him and said, "Why, do I look like Tonto?"

Father of college boy to mother with letter: "Never mind reading me the whole letter. Just read me the 'By the way, Dad,' part."

* * * *

Lord Derek — "Did you cancel all my engagements, as I told you, Ruggles?"

Valet — "Yes, sir, but Lady Gwendolyn didn't take it very well. She said you were to marry her next Monday!"

* * * *

"Paron me, Mrs. Vere de Vere, but has your son ever earned anything by the sweat of his brow?"

"We Vere de Veres never perspire."

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SPACE PERCEPTION [Cont.]

important concepts in binocular vision. It may be restated as follows: corresponding retinal elements are those elements of the two retinas which in binocular vision give rise to the localization of the sensation in one and the same visual direction.

Of special importance is the common visual direction of the foveas. It is designated as the *principal visual direction*. Since the visual directions of the other (non-foveal) elements have only a position relative to the principal visual direction, they determine the orientation of spatial sensations *relative to each other* with the principal visual direction as the direction of reference.

If the retinal elements were distributed symmetrically so that when, by mentally superimposing the right retina upon the left, a pin stuck into any part of the retinas should strike corresponding retinal elements, one could say corresponding retinal elements are those elements which have the same relative position with respect to the fovea. However, this is correct only grossly as can be determined experimentally, namely by horopter data.

The "horopter" refers to the locus of points in space which are imaged on corresponding retinal elements. As stated previously, when two retinal points are stimulated, a directional and a separation value results. It is on these relationships that the empirical determinations of retinal correspondence are based. That is, the position in space of pairs of objects that appear to have the same direction as seen by each eye may be determined empirically. They are measured from some assumed optical or anatomical point such as the mean point or the apex of the cornea.

In a complicated optical system, such as the eye, the positions in space of such projection paths are a series of lines whose intersections lie on a coustic surface and not at a common point. By assuming that these lines are straight lines and pass through a single mean nodal point at fixed distances from the cornea of each eye, their intersections will determine a line in the visual plane—the so-called longitudinal horopter. This is the classical Vieth Mueller circle which passes through the fixation point and the mean nodal point of each eye. The empirically determined horopter does not lie on the theoretical Vieth-Mueller circle but is much flatter (Hering-Hillebrand deviation). This difference is attributed to an asymmetry of the retinal elements such that the images formed by the nasal half of the retina are larger than those formed by the temporal half.

Binocular vision is the coordinated use of the two eyes resulting in a single perception of external space and the specific sensation of stereoscopic depth perception. The final perceptual images from the two eyes are said to "fuse" in the brain and through the strength of the fusion impulse all movements of the eyes become coordinated in the process of fixating different points in space.

Stereoscopic vision rests upon the fact that each of the two eyes, by virtue of their separation, sees objects in the visual field from a slightly different point of view. Hence, the two retinal image patterns are slightly dissimilar. The angular separation of the retinal images, arising from two points in space, will be different in the two eyes, if one of the points is farther away from the observer. The difference in angular separation defines a disparity between the images. Stereoscopic depth perception arises by virtue of the disparity between the retinal images: uncrossed disparity is associated with the sense of distance away from the fixated point while objects seen in crossed disparity are seen nearer than than the fixated point. The sensation of stereopsis is a specific sensation and depends upon the physiological and anatomical organization of the retinal elements of the two eyes.

(*to be continued*)

Texas cattleman to visitor: "We don't brand them — we have them engraved."

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"Did you learn very much on your first day of school, Johnny?" asked mother.

"Not enough, I guess," replied Johnny, "I have to go back again tomorrow."